REMARKS

Claims 1-6 are now in this Application, and are presented for the Examiner's consideration.

Objection to Drawings

The drawings were objected to as not showing every feature of the invention, and specifically, it was stated that the "drawing surface" in claim 1 and elsewhere, and the groove and the embedded rollers in claim 3, must be shown or these features must be canceled from the claims.

In this regard, reference to the "drawing surface" in claim 1 has been canceled.

Further, the groove is the vertical direction guide 21 in the Fig. 4A. In this regard, the specification has been amended to refer to this as a vertical direction guide or groove 21, so as to ensure support for the same in claim 3.

As to the shaft of the at least two rollers being embedded in the groove, this language has been changed to recite that the shaft is guided in the groove. Support is found at page 9, lines 19-24 of the specification.

The drawings were also objected to because they fail to show the bracket 10 connected with the moving rollers 18 and 19 as described at page 9, lines 15-17 of the specification. The specification has been amended to recite that there is provided a

bracket 10 associated with the movable rollers 18 and 19 for moving the movable rollers 18 and 19 in the vertical and horizontal directions. Clearly, this is shown in Figs. 4A and 4B.

Finally, it was also stated that the groove in claim 3 and the embedded rollers in claim 3 are not described in the specification. In this regard, it is submitted that the amendments and comments made above cover this objection.

Accordingly, it is respectfully submitted that the objection to the drawings has been overcome.

Rejection of Claims under 35 U.S.C. §101

Claims 1-6 were rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter.

It was stated that claim 1 requires that the two rollers are "moving" and that this movement is a method step. However, this is not correct. There are no method steps. However, to advance prosecution, the word "moving" as to the "at least two moving rollers" in claim 1 has been changed to "moveable."

In addition, it was stated that claim 4 requires both apparatus and method steps, namely, the rotation of the bracket is a method step. Again, in like manner, to overcome this rejection, claim 4 has been amended to change the word "rotates" in claim 4 to "is rotatable."

Accordingly, it is respectfully submitted that the rejection of claims 1-6 under 35 U.S.C. §101 has been overcome.

Rejection of Claims under 35 U.S.C. §112

Claims 1-6 were further rejected under formal grounds under 35 U.S.C. §112, first paragraph.

It was stated that there is no support for the fixing roller immediately following the controller unit, and that there is no literal support for the limitation and the drawing shows that there is structure between these features.

Claim 1 has been amended to recite an optical fiber processing apparatus including an optical fiber standard value controller unit adapted to control standard values of the optical fiber drawn. The optical fiber processing apparatus is comprised of elements 13-16. Claim 1 has been further amended to recite that the fixing roller immediately follows the optical fiber processing apparatus, which is clearly shown in Fig. 3.

In addition, it was stated that the Examiner could not find support for the newly claimed limitations that relate to adjusting the curvature "by an adjusted curvature radius" (claim 1, line 8) and changing a drawing direction "by a curvature radius" (line 12). Specifically, it was stated that adjusting "to" something does not provide support for adjusting "by" something.

In this regard, claim 1 has been amended to eliminate the language as to claim 8, and replace the same by reciting: "a roller arrangement ... which draws said optical fiber substantially around a circular arc having an adjusted curvature radius." As to line 12, claim 1 has been amended to change "by a curvature radius" to "to a curvature radius," as suggested by the Examiner.

Accordingly, it is respectfully submitted that the rejection of claims 1-6 under 35 U.S.C. §112, first paragraph, has been overcome.

Claims 1-6 were further rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

Specifically, it was stated that the claims require adjustments being "by" a radius, but that the application and specification indicate that the adjustments are "to" the radius, and the Examiner stated that it is unclear if there is any difference between these two terms.

In this regard, as stated above, claim 1 has been amended to correct this language.

As to the terms "adjusted curvature radius" and "curvature radius," it was stated that these terms are not defined in the specification. However, the specification specifically defines and refers to these terms as adjusted curvature radius R2 and

curvature radius R1 (see page 9, lines 5-12) and Fig. 3.

In regard to the Examiner's comments regarding the fact that the arc is somewhat like a circle, it is noted that the arc is substantially a circle, and the adjusted curvature radius R2 of the optical fiber holds true to this substantially circular arc. Any movements of the rollers will be such as to retain this substantially circular arrangement, as will be understood from the discussion as to the prior art hereafter. Of course, since the fiber is contacted by three points on the three rollers 17-19, there will not be a "perfect" circle, but there will certainly be a substantially circular arc, as shown in Fig. 3. If, for example, roller 18 moves up, the arc will still be a substantially circular arc but will be a smaller arc of a larger circle, and thereby, the adjusted curvature radius R2 will increase.

However, it must be emphasized that a substantially circular arc of the optical fiber will be presented, regardless of the positions of rollers 18 and 19, and will always have an adjusted curvature radius R2 which is greater than the curvature radius R1 of roller 17.

It is submitted that this would be readily evident to one skilled in the art.

As to page 11, second paragraph of the Office Action, the bending stress equation is defined at page 4, line 8 as ρ_b =

E_y/R, where E_y is Young's modulus of elasticity and R is the radius. Clearly, if the adjusted curvature radius R2 is large, since this is in the denominator of the equation, the bending stress will be small. This is very different from the case of Fig. 1 where only the curvature radius R1 is taken into account, and the bending stress is thereby much higher. This makes sense from a practical standpoint as well. If the adjusted curvature radius R2 is large, then the angular direction change for each roller 17, 18 and 19 will be less, resulting in less bending and thereby less cracking of the optical fiber. This is the essence of the present invention.

The Examiner states that the equation makes no mention of the length of the bend. However, this is inherent in the value of R in the equation. If the value of R is large, it indicates a larger circle so that the length of the bend is thereby inherently increased, as in Fig. 3, while if the value of R is small as in the prior art of Fig. 1, it indicates a smaller circle so that the length of the bend is thereby inherently decreased, as in Fig. 1.

As to claim 2, this claim has been amended the recite a bracket connected to at least one of the at least two rollers, in order for the at least two rollers to move in at least one lengthwise direction relative to the optical fiber. Thus, the word respectively has been removed. Further, reference to the

drawing surface has been removed, and instead, it now refers to the at least one movable roller moving in at least one lengthwise direction relative to the optical fiber. Specifically, by movement along the groove 21, the roller can move in the vertical or Y-direction. By pivoting about pivot joint 22, the roller will move in both the X- and Y-directions. Thus, the roller moves in at least one lengthwise direction X or Y. This is distinguished from roller 23 of Yoshida et al, for example, which only rotates about its own axis as shown in Fig. 4 thereof.

As to claim 4, as discussed above, the language has been changed to make it clear that there are no method steps.

Further as to claim 4, the language has been amended to recite that the pivot joint is installed at one end of the bracket.

Claim 5 has been amended to change "a bracket" in line 5 to "the bracket" to ensure that there is proper antecedent basis.

As to claim 6, the language "adapted to impress a spin to the optical fiber" has been deleted since this language is superfluous since it is already recited in claim 5.

Accordingly, it is respectfully submitted that the rejection of claims 1-6 under 35 U.S.C. §112, second paragraph, has been overcome.

Prior Art Rejections

Claim 1 was rejected under 35 U.S.C. §102(b) or 35 U.S.C. §102(e) as being anticipated by PCT Published Application No. WO 00/44680 or U.S. Patent No. 6,519,404, both to Yoshida et al and both being equivalent to each other.

Yoshida et al had previously been cited against the claims in the present application in the previous Office Actions.

Yoshida et al is not at all concerned with breakage. Specifically, Yoshida et al is concerned with polarization mode dispersion (PMD). As discussed at column 1, lines 25-36 thereof, in order to avoid this problem, it has been proposed to use a guide roller that periodically swings in the direction of its rotation axis, thereby imparting predetermined twists to the fiber. This is provided by the roller 23 of Yoshida et al which swings about its axis, as shown in Fig. 4 thereof. Yoshida et al states, however, that there may be residual twists stored in the coated optical fiber which travels to the winding-up reel 27 (column 2, lines 58-63), and these residual twists can result in internal stress therein.

To eliminate these residual twists, Yoshida et al provides a free zone in which the optical fiber travels straight without touching any other member such as a guide roller. (Column 3, lines 28-30). This is the length L between take-up roller 26 and wind-up reel 27 in Fig. 1A of Yoshida et al. As a result, in the

free zone, the optical fiber is free to rotate about the axis of the optical fiber, thereby longitudinally canceling out elastic torsion stored in the optical fiber (column 4, lines 10-12).

Preferably, the free zone is a region between two guide members (26, 27) so that the optical fiber travels straight between the two guide members. However, at least one intermediate roller (4, 5) having a smooth roller surface (so that there is no twist imparted) can be provided which also allows the optical fiber to reduce the residual twists.

The reason for providing rollers 4, 5 is to increase the length of the free zone, and thereby provide a greater length over which the optical fiber can untwist.

The present invention also provides an arrangement for decreasing the polarization mode dispersion (PMD), namely, by imparting a spin to the optical fibers by reciprocating the bracket 10 in a transverse direction with respect to a drawing plane of the optical fiber. See Fig. 6B of the present application. As a result, there is no need to provide any free zone in the present invention.

Rather than using movable rollers to increase the length of a free zone and thereby reduce residual twist in the optical fiber, the movable rollers of the present application are intended to increase the radius of the circular path of travel of the optical fiber, that is, to eliminate sharp turns in the path

of the optical fiber, and thereby reduce cracking of the optical fiber due to bending stresses. This aspect is nowhere disclosed or even remotely suggested in Yoshida et al, and in fact, Yoshida et al does not even recognize this problem of bending stresses.

To accomplish this, movable rollers 18 and 19 are provided following the fixing roller 17 (immediately after the optical fiber processing apparatus which is comprised of elements 13-16 in Fig. 3 of the present application). Movable rollers 18 and 19 provide a radius of curvature of the optical fiber which is termed in the application the "adjusted curvature radius." It is clear that, if the optical fiber has an adjusted curvature radius, and in fact, any radius, it must necessarily travel around a circular arc, or at least, substantially around a circular arc. This is also clearly shown in Fig. 3 and certainly, one skilled in the art would recognize the same. In this regard, if the optical fiber always has a radius, it always travels substantially around a circular arc. This is because the rollers 17-19 are all on the same side of the optical fiber.

Therefore, by providing movable rollers 18 and 19, in addition to fixing roller 17, the radius R2 of the substantially circular arc over which the optical fiber travels, does not provide any sharp angles, thereby reducing any bending stress in the optical fiber, and thereby reducing cracks in the optical fiber.

The Examiner provides copies of Fig. 2 of Yoshida et al to show different circular arcs thereon. However, the optical fiber of Yoshida et al does not travel around any circular arc in Fig. 2. Rather, the drawn circles are merely circles connecting the axes of the rollers therein. The optical fiber, instead, has a sharp angle at each of rollers 3-6. This, however, has the disadvantage of increasing the bending stress and resulting in breakage of the optical fiber, as discussed in the present application. In this regard, Yoshida et al actually teaches away from the present invention.

In order to make this distinction clear in the claims, claim 1 has been amended to recite:

a) an optical fiber processing apparatus including an optical fiber standard value controller unit adapted to control standard values of the optical fiber drawn. The optical fiber processing apparatus is comprised of elements 13-16.

b) a roller arrangement (17-19) which provides a direction of travel of the optical fiber at an output thereof which is different from a direction of travel of the optical fiber at an input thereof. It is seen that the direction of travel at input fixing roller 17 is almost 180 degrees different from the direction of travel at output movable roller 19.

c) the roller arrangement (17-19) draws the optical fiber substantially around a circular arc having an adjusted curvature

radius. See the discussion above.

d) a fixing roller immediately following the optical fiber processing apparatus.

e) at least two movable rollers immediately following the fixing roller and on a same side of said optical fiber as said fixing roller. This provides the substantially circular arc of the optical fiber.

f) the at least two movable rollers having axial centers which are movable to different positions for gradually adjusting the adjusted curvature radius of the optical fiber which has a changed drawing direction in order to release bending stress and stress concentration in the optical fiber and thereby decrease a possibility of breakage of the optical fiber.

g) the fixing roller and the at least two movable rollers being arranged so that the optical fiber always travels substantially around a common circular arc having the adjusted curvature radius.

Each of these limitations will be discussed relative to Yoshida et al.

As to a), Yoshida et al does include optical fiber processing apparatus, as would any such apparatus.

As to b), the cited roller arrangement (3-6 of Fig. 2) changes the direction of the optical fiber but the input direction at roller 3 is the same as the output direction at

roller 6 in Fig. 2 thereof, contrary to the limitations of claim 1. With the present invention, the input direction at roller 17 is almost 180 degrees out of phase with the output direction at roller 19.

As to c), the cited roller arrangement (3-6 of Fig. 2 of Yoshida et al) clearly does not draw the optical fiber substantially around a circular arc having an adjusted curvature radius. It is noted that, during the normal drawing speed in Yoshida et al, that is, during normal operation, rollers 4 and 5 are in their raised positions 4, 5, and not 4', 5'. See column 6, lines 54-57 of Yoshida et al. Because of this arrangement in Yoshida et al, there are sharp changes in direction at each roller 3-6, which would result in bending stresses thereat and cracks in the optical fiber, contrary to the present invention.

As to d), Yoshida et al discloses a fixing roller 23 (Fig. 1A) immediately following the optical fiber processing apparatus. However, the fixing roller 23 is not part of the cited roller combination (3-6) between roller 26 and wind-up reel 27. In fact, fixing roller 23 provides a 90 degree turn, similar to the prior art of Figs. 1 and 2 of the present application, along with the same disadvantages.

As to e), although there are at least two movable rollers (4, 5 in Fig. 2), these rollers do not immediately follow the fixing roller (23). More importantly, they are not on a same

side of the optical fiber as the fixing roller, as required by claim 1. As a result, as clearly seen from Fig. 2 of Yoshida et al, this does not provide a substantially circular arc of the optical fiber. Thus, there are sharp bends at each roller 3-6, rather than the large radius substantially circular arc of the optical fiber according to the present invention.

As to f), although movable rollers (4, 5) have axial centers which are movable to different positions, they do not gradually adjusting an adjusted curvature radius of the optical fiber, since there is no circular arc or radius of the optical fiber in Yoshida et al, and certainly they do not move in order to release bending stress and stress concentration in the optical fiber and thereby decrease a possibility of breakage of the optical fiber, as claimed. Yoshida et al is not concerned with this aspect of the present invention, and has not even considered the same.

g) the fixing roller and the at least two movable rollers are arranged so that the optical fiber always travels substantially around a common circular arc having the adjusted curvature radius. As discussed above, since the specification teaches that the optical fiber has a radius, and therefore, in order to have a radius, it must travel around a circular path. This aspect is totally lacking from Yoshida et al. Although a circle can be drawn around rollers 3-5, as was done by the Examiner, this does not mean that the optical fiber travels in a

substantially circular path, and in fact, in Yoshida et al, it does not do so. As a result, there are sharp bends at each roller 3-6 which can result in cracking of the optical fiber.

As clearly shown in Yoshida et al, there is no gradual change in curvature accomplished by at least one or more moving rollers. Rather, all of the changes in direction accomplished with movable rollers are sharp changes in direction.

Thus, the construction of the present claimed invention, as now recited in claim 1, is quite different from that of Yoshida et al.

Accordingly, it is respectfully submitted that the rejection of claim 1 under 35 U.S.C. §102(b) or 35 U.S.C. §102(e), has been overcome.

Claims 2-5 were rejected under 35 U.S.C. §103(a) as being obvious from Yoshida U.S. Patent No. 6,519,404 as applied above, and further in view of newly cited U.S. Statutory Invention Registration No. H1268 to Askins et al.

The remarks previously made above in regard to Yoshida et al are incorporated herein by reference.

Askins et al was merely cited for disclosing the use of a bracket to move a roller. However, in all other respects, Askins et al fails to cure any of the aforementioned deficiencies of Yoshida et al.

As to claim 5, this claim recites spin apparatus capable of impressing a spin to the optical fiber by reciprocating the bracket in a transverse direction with respect to a drawing plane of the optical fiber. There is no disclosure or any suggestion in either Yoshida et al or Askins et al of provided any apparatus to impress a spin to the optical fiber, particularly in the manner recited in claim 5.

Accordingly, it is respectfully submitted that the rejection of claims 2-5 under 35 U.S.C. §103(a) has been overcome.

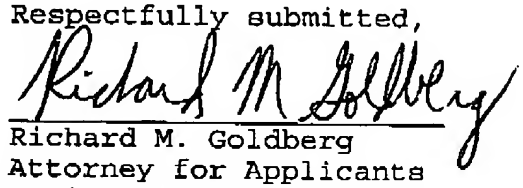
If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

In the event that this Paper is late filed, and the necessary petition for extension of time is not filed concurrently herewith, please consider this as a Petition for the requisite extension of time, and to the extent not tendered by check attached hereto, authorization to charge the extension fee, or any other fee required in connection with this Paper, to Account No. 07-1524.

The Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1524.

In view of the foregoing amendments and remarks, it is respectfully submitted that Claims 1-6 are allowable, and early and favorable consideration thereof is solicited.

Respectfully submitted,



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